
ABSTRACT

A system for synthesizing a nano-scaled powder material, including several sub-systems: (A) a chamber for containing nano-scaled cluster generating devices from a material selected from the group consisting of a metal, a metal compound, and a ceramic; (B) a twin-wire electrode device disposed within this chamber with this electrode device including: (i) two wires made up of this material, each having a leading tip and each being continuously or intermittently fed into the chamber in such a fashion that the two leading tips are maintained at a desired separation; and (ii) power supply for providing electric current and gas supply for providing a working gas flow for creating an ionized arc between the two leading tips for melting and/or vaporizing the material to generate nano-scaled clusters; (C) devices for injecting a quench gas and/or a reaction gas into a quenching/reaction zone inside the chamber at a point downstream from the arc to produce nano-scaled powder particles; and (D) devices such as a cyclone and powder classifier to collect the nano-scaled powder material.